Army Foresight

Searching for Sustainability

March 07: Emerging Ecosystem Services and Markets

EDITION 3.1

In this edition:
Can the Army benefit from carbon sequestration trading and other emerging ecosystem service markets?

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Introduction to Foresight Process

Welcome to the third edition of our new Foresight series. In each edition, we focus on a topic currently on the Army Environmental Policy Institute's "radar screen" and present key points from our preliminary research in a short report. We introduce a specific topic, discuss why it is important to the Army, and present several key areas for further study.

The AEPI's mission is to assist the Secretariat with the development of proactive policies and strategies to address environmental issues that may have significant future impacts on the Army.

Foresight is the ability to look forward. We deliberately, methodically gather intelligence to follow trends and identify emerging issues. Foresight extends three years and more into the future — offering directions, not making predictions. The issues of concern have the potential to affect the Army's ability to achieve its mission and warrant further study and discussion.

Foresight helps achieve sustainability by improving policy today to prevent current undesirable trends from becoming future intractable issues. It includes three components: systematically scanning trends, encouraging participation and buy-in, and building vision to improve policy. Foresight is ongoing. Topical specialists continuously track issues and offer topics for discussion, recognizing the present and creatively considering the future.

Each brief report introduces a topic, discusses its significance to the Army, and delineates key areas for further study. We do not recommend specific policy or suggest that we know the final solution. We offer these reports to interested parties to solicit comment and encourage sharing. They are designed to generate discussion and invite collaboration with our military partners, as well as potential collaborators in science, academia, industry, and other organizations. The reports summarize the topics, and they contain hyperlinks to relevant publications with details that facilitate further research.

We invite you to join us on our journey in the search to sustain the Army mission and secure the future. To register your comments on this issue, please contact AEPI at 703-604-2305 or aepi.administrator@hqda.army.mil.

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MARCH 2007

THE ISSUE: EMERGING ECOSYSTEM MARKETS

The Army has made significant investments in protecting the ecosystems that provide critical natural resources to sustain military operations and the installations that support them. The 25 million acres of land under the stewardship of the Army and other DoD components harbor more threatened, endangered, and at-risk species per acre of habitat than any other federal lands.[1] These assets must be sustained to meet the needs of current and future missions.

Extensive mandatory protections have emerged over the last several decades at national, state, and local levels. Those mandates require installations to protect and enhance populations of and habitat for at-risk species. The protections often extend beyond military-managed lands to include regional habitat resources necessary for the recovery of at-risk species populations.

Today, 90 percent of all DoD lands are in 14 ecoregions, with over 50 percent found in 4 ecoregions.[2,3] Therefore, the Army has much to gain by managing our natural resources on a regional scale, rather than within the isolation of our fence lines. In this regard, the private sector has shown growing interest in applying an economic value to natural resources, or ecosystem services.[4] Much like economic services, ecosystem services are processes by which the natural environment produces resources useful to people. Those processes include provision of

- clean water and air,
- flood control,

- pollination of crops,
- environmental hazards mitigation,
- pest and disease control, and
- carbon sequestration in trees, plants, and marine ecosystems.

Fulfillment of people's aesthetic, spiritual, and intellectual needs is a key byproduct of effective ecosystem services.[5]

Ecosystem service markets are economic tools for conserving ecosystem services whose benefits are quantified as a value or currency that is then traded between a buyer and a seller. For example, sulfur dioxide (SO_2) allowances to offset greenhouse gas emissions are traded on the Chicago Climate Exchange. Market opportunities include investment and trading in carbon sequestration, water quality, groundwater recharge, flood control, and biological diversity.

William D. Goran from the Construction Engineering Research Laboratory of the U.S. Army Engineer Research and Development Center furnished the foundation for the concepts presented in this document

[1] See http://www.natureserve.org/aboutUs/PressReleases/nr040824.pdf.

[2] Dr. Michael Scott, Speech at June 2005 Symposium and Workshop on TER-S on DoD and Adjacent Lands Plenary.

[3] An ecoregion is a large area of land or water that contains a geographically distinct natural community.

[4] G.C. Daily and K. Ellison, *The New Economy of Nature: The Quest to Make Conservation Profitable* (Washington, DC: Island Press, 2002).

[5] See http://www.ecosystemservicesproject.org/html/markets/overview/whatES.html.

Analysis and Impact

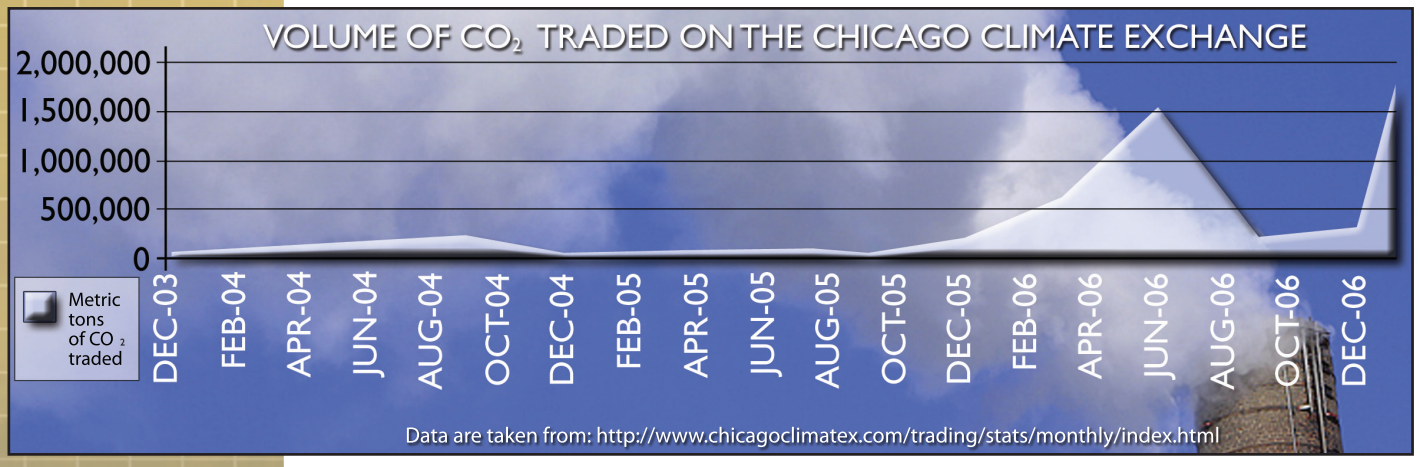
What is the potential impact of ecosystem services on military operations? As ecosystem services are quantified, and some or all enter market economies, the Army will likely be able to enter into tax reduction or tax credit partnerships with resource managers and land owners.

Ecosystem markets can increase the value of land in a natural state, making open space or natural habitat management economically competitive with land development. They also can help control sprawl, potentially reducing encroachment.

Ecosystem service markets provide a strong link between the environment and the community through "values" established in trading. For the Army, this means that ecosystem service markets provide the opportunity to link its environmental stewardship to ongoing and future missions, thereby supporting the Army's triple bottom line of sustainability (mission, environment, and community), while realizing substantial financial savings.

The following are examples of ecosystem service markets that support the triple bottom line:

- **Natural carbon sequestration.** *Forested lands capture carbon dioxide (CO_2). Utility companies may need to offset their CO_2 emissions. An installation could quantify its forested areas on base and sell the associated CO_2 sequestration credits to a utility. As an example of the potential value, greenhouse gas storage in forests can be as high $2,200 per hectare.*[6]
- **Habitat banking.** *Habitat for endangered and threatened species extends beyond the fence line. Quantifying its value allows installations to purchase or trade credits from other habitat banks in the same region. This could increase training capacity by reducing on-post endangered species restrictions. It would also allow regulators to manage species and habitats across regions.*
- **Natural filtration.** *Wetlands act as a natural filtration system. Installations could identify their ecosystem service value and use filtration credits or trade them for another environmental service needed to comply with requirements.*
- **Pollutant cap and trade.** *Regulatory bodies set overall caps on pollutants such as SO_2 and allocate pollutant baseline quantities to the producers. Producers could reduce their own emissions and sell the resulting credits, or they could purchase credits from others to avoid treatment or noncompliance costs.*



[6] See http://ecosystemmarketplace.com/pages/static/about.conservation_backgrounder.php#3.

AREAS FOR FURTHER STUDY

Creating markets for environmental services is challenging. Among the challenges are high transaction costs,[7] commodity quantification and verification, setting of baselines, allocation of initial "rights,"[8] supply and demand, monitoring, conservation goal setting, leakage (actions outside of the coverage area), unpredictability of market strategies and gaming, and permanence (predicting long-term effects). Despite these many hurdles, market concepts present a variety of innovative approaches to achieving desired environmental outcomes.

MONITORING INNOVATIVE SOLUTIONS

Ecosystem service markets depend on regulatory agency involvement and mandated policies.[9] The Army would benefit from monitoring developing markets and solutions and identifying opportunities to influence emerging federal and state policies. The Army could capitalize on ecosystem service values in several ways:

- Carbon sequestration value from forested areas
- Preservation of buffer space through market trades
- Biofuel partnerships
- Renewable energy credits
- Preservation of regional species and habitat.

Research should track emerging policies and identify barriers to the Army's engagement in these markets. An important focus is the emergence of carbon trading markets and the need to understand the carbon footprint (emissions and sequestration) of Army activities. Early investments and understanding can help the Army creatively partner with regulators and stakeholders.

ENGAGING AND USING PARTNERSHIPS

The optimal protection of biodiversity is a task too complex and all-encompassing to be tackled by scientists alone, or even by an interdisciplinary team of academics. By actively involving a diverse group of conservation practitioners and economists, the Army can refine its contributions to this essential discipline. For example, Fort Bragg, NC, is making inroads in this increasingly important area through its participation in the Southeast Regional Partnership for Planning and Sustainability (SERPPAS). SERPPAS actively engages federal, state, and local government agencies; DoD; and other stakeholders across a five-state region to develop collaborative solutions that benefit all partners while sustaining the region. The Army and DoD should continue to build upon existing relationships with communities, regions, and states, as well as form new and nontraditional partnerships to help shape comprehensive planning and compatible land-use policies that will protect mission-important ecosystem services around their installations.

[7] R.N. Stavins, "Transaction Costs and Tradable Permits," *Journal of Environmental Economics and Management,* 1995, 29: 133–148.

[8] J.R. Rosales, *Renditions of Progress: United Nations Climate Change Policy and the Values of Tradable Permits* (Ann Arbor, MI: UMI Dissertation Services, 2004).

[9] See http://www.fs.fed.us/ecosystemservices/.

MILITARY IMPLICATIONS

The emergence of ecosystem service markets will affect the Army regardless of our participation. Therefore, we must be on top of this issue. If the Army decides to enter the ecosystem service market, we will need to be prepared and fully understand the associated risks and rewards. When determining how it will engage ecosystem markets, the Army will need to consider several factors.

POLICY

The Army will need to determine if it has legal authority to engage in or establish ecosystem service markets and to what degree. If it has legal authority, the Army will need to develop policy and guidance on how to implement ecosystem services and participate in associated markets.

ROLES AND RESPONSIBILITIES

Ecosystem services constitute a new discipline that integrates biology, business, economics, engineering, law, and Army Corps of Engineers real estate and wetland specialists into the design of ecosystem service programs and investments. Such integration will require increased collaboration, information exchange, and technology transfer, as well as clearly defined roles and responsibilities.

Ecosystem service programs are not a budget line item. The Army will need to investigate ways to fund these types of projects. It will also need to investigate the legality of receiving revenues from the sale of Army ecosystem services. Legislative authority similar to DoD's conservation reimbursable programs may need to be established.[10]

RESEARCH

To prepare for the emergence of ecosystem service markets, the Army will need to make strategic investments in research, improve its expertise in quantifying the costs and benefits of ecosystem services, and integrate ecosystem service approaches into ongoing and emerging policies and programs.

The Army will also need to identify opportunities to leverage other Army programs, such as compatible-use buffers and conservation reimbursable programs, and determine how ecosystem markets can further support other programs.

In addition, the Army will need to assess the public's perception of using public lands for ecosystem services.

REGIONAL ECOSYSTEM COORDINATION

At the large, regional scale, the military mission often precludes the conversion of surrounding land to more intense land uses such as urbanization — a clear, long-term benefit to natural resources. However, neither the benefit nor the cost of military actions and inactions on a regional scale has been sufficiently quantified to inform regional decisions. Understanding and quantifying the costs and benefits will help the Army and the public improve stewardship of shared precious resources and sustain mission activities.

[10] See http://aec.army.mil/usaec/natural/natural03.html.

ARMY ENVIRONMENTAL POLICY INSTITUTE
1550 CRYSTAL DRIVE, SUITE 1301, ARLINGTON, VA 22202
703-604-2305 (PHONE) 703-604-2344 (FAX)
aepi.administrator@hqda.army.mil

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